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ABSTRACT

International transfer, defined as the process of diffusing a product or idea across national boundaries, has become an increasingly significant source of educational innovation in recent years. In order to analyze the outcomes of an international transfer project, three dimensions should be considered. The first, the amount of change in the transferred product, might range from no changes to the addition of content, procedures or objectives. The second dimension is the amount of research and development effort generated in the transfer process. The third dimension is the effectiveness of the transfer effort and of its final product. The development of educational materials generally follows the product-market analysis model, in which all information about education/market variables is integrated and weighed in a number of stages. Systematic evaluation may make an important contribution to this process. The model is illustrated with a case study of the development of arithmetic games for primary schools. (BW)

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EDUCATIONAL PRODUCT DEVELOPMENT IN AN INTERNATIONAL PERSPECTIVE

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EDUCATIONAL PRODUCT DEVELOPMENT IN AN INTERNATIONAL PERSPECTIVE

0. Introduction and overview

In this presentation we want to discuss the concepts of international Transfer and Evaluation as important issues in developing an educational product development strategy. Especially when the national product development strategy is to be part of an international transfer and adaptation effort the importance of sound product development strategy, based on sound evaluation, is of utmost importance. We will develop the concept of international product development and evaluation in four parts:

First, we will review some of the past experiences on large scale international transfer of educational innovations and products, and will try to draw some general inferences for product development in educational publishing.

Second, we will briefly discuss the consecutive steps of product development model as it has been adopted (with variations) by Wolters-Noordhoff. From this model you may be able to infer yourself how this product development process differs between companies, and what effects this may have on future international cooperative efforts.

As a third element we will introduce some of the basic concepts of evaluation as they have been applied by us as tools in educational product development. We will include an example of educational product development strategy, based on the product development model and the evaluation tools we have discussed in the previous sections.

Finally we will make some observations and draw some general conclusions.

I. International transfer of educational products and innovations

1. Description

International transfer, which will be defined as the process of diffusing a product or idea across national boundaries, has become an increasingly significant source of educational innovation in recent years. National governments, multinational corporations as well as international organizations such as the United Nations and the OECD/CERI regard the transfer process as a viable alternative to the implementation of the original research and development. The latter method of stimulating educational innovation is often not feasible for organizations which have limited financial and scientific resources. The interest for large scale educational transfer was triggered by the notion that whereas the international transfer of industrial products and innovative ideas was well-established, the international transfer in the educational field was negligible.

2. International research projects on transfer

The number of educational transfer projects is increasing as a result of growing international interest and communication. However, most of these projects are quite limited in scope and lack an adequate evaluation component to determine their effectiveness. Carlson (1968), for example, concluded his review of research on educational diffusion with the observation that the methodology used in these studies has such serious shortcomings that "... it is rather difficult to count on what is known about diffusion."

Furthermore, the process of international transfer has not been well documented, nor have there been systematic attempts to analyse factors which facilitate or inhibit successful transfer (Rogers and Shoemaker, 1971). Most available research studies seem to suffice with describing the particular transfer projects, without

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providing any indication of the general implication of their study to other transfer processes (Rogers and Shoemaker, 1971; Miles, 1964; Chow, Hutchins and Sikorsky, 1973). Of course there are a few exceptions, such as the international transfer of BSCS (Biology Science Curriculum Study) and "Sesame Street", which have been comparatively well documented.

In view of these apparent deficiencies in the available educational transfer studies, the evaluation and analysis of the International Minicourse Transfer Project, in which I have been involved, is of particular significance. This international transfer effort, which was sponsored by the OECD/CERI after the IMU project (Individual Mathematics Units), was the first large-scale project whose specific aim was to contribute to the general understanding of the transfer process of educational innovations. To insure the integrity of this objective, the participants were not only requested to adopt an identical transfer and adaptation process which incorporated a rigorous redevelopment design, but also to conduct the project simultaneously in all participating countries. The results of these transfer projects could provide a valid basis for comparative analysis and evaluation, and perhaps facilitate the development of a model for future transfer. In addition, the analysis of the comparative outcomes may result in recommendations and guidelines of general significance to educational transfer efforts.
In the final analysis of costs and benefits in regard to transfer we might apply some of the criteria used in these large-scale international studies.

3. Dimensions of transfer: a conceptual framework

In order to analyze and weigh the outcomes of an international transfer project, it is important to discuss some major dimensions along which a transfer process can be evaluated. In this regard the following dimensions seem to be of significance:
1) the amount of change in the transferred product, in comparison to the original;
2) the amount of research and development effort generated in the transfer process;
3) the effectiveness of the transfer effort and of its final product.

1. Amount of Change

The first dimension concerns the changes made in the original product during the transfer process; in other words, how does the product resulting from the transfer differ from the original? In the case of the international transfer of educational materials, these changes could be classified in the following categories:
A. No changes.
B. Translation only. This procedure is often used with books and movies (subtitles, or dubbing over the original soundtrack).
C. Substitution of content (especially examples), procedures, objectives or media. This category of change is often found in the transfer of educational packages for school use.
D. The deletion of content, procedures or objectives.
E. The addition of content, procedures or objectives.
When the transferred product differs from the original in the last three categories, we will call it "adaptation". Of course, within each of these categories the change can range from minor differences to a totally different product. It is possible to apply a number of quantifiable measurements within each category. Examples of quantifiable measures are, the number of

illustrations, the number of concepts, the number and length of examples, the number of objectives which were changed in the transferred product in comparison with the original product, etc.

2. Amount of effort, especially in Research and Redevelopment

The second major dimension of transfer concerns the amount effort, especially in research and redevelopment conducted in the transfer process. The R & D cycle usually starts with a needs assessment to find out what product would be particularly useful in the transferring country. This assessment procedure can vary from gathering the opinions of a few experts to a fullscale market research study. In the second phase, a prototype product is developed which can subsequently be tried out in a field test. The extensiveness of this test again can vary. On the basis of the field test findings the prototype can then be revised. The next step could include an additional field test, which leads to other revisions. This cycle can be repeated until a satisfactory final product results.
In the second dimension we can analyse transfer using the following criteria:

A. Was a needs assessment conducted by the transferee and, how thorough was that assessment? We may analyse the decision-making processes which resulted in the selection of a particular product for transfer.
B. How elaborate was the research and redevelopment process as conducted by the transferee? We can analyse this on the basis of the number of revised products which were produced, and on the number and extensiveness of the field tests conducted. In other words: how often was the prototype product recycled through the R & D process and how elaborate was this process?

3. The Effectiveness of Transfer

The third major dimension of transfer concerns the measurement of its effectiveness. In this process the following criteria would be of importance:

A. Did the transfer project result in a final product? If a transfer project was discontinued during the development process, it is interesting to analyse the specific factors which influenced this.
B. Did the transfer product attain its objective? In the case of adaptations, did the adapted product result in appropriate changes in behavior and learner results? From this analysis we can also compare the number of behavior changes resulting from the original product to those resulting from the adapted version.
C. How did the market/target population (the group of people for whom the product is intended) rate the adapted product? This rating is especially important in regard to other products, which could serve as an alternative for the adapted product.
D. How many products have been sold per time period, in other words: How many members of the target population have been reached with the adapted product (use the adapted product) after a certain period? This could also be called the degree of commercial success of the product.
E. Did the transfer project/product generate additional projects in the receiving country? The number of follow-up projects resulting from the initial transfer constitutes an important criterion for measuring the effectiveness of this process. It provides a measurement of the success with which the product has been assimilated by the transferee and the impact of the transfer on the receiving country. The follow-up research and development may very possibly consitute a beneficial effect whose importance subsedes that of the adapted product.

The three major dimensions of transfer, which we developed in the previous discussion, constitute the conceptual framework, which might be very helpful when applied to the subsequent analysis of international transfer projects.

4. Some observations on effects of international transfer

Based on the BSCS, Sesame Street and Minicourse transfer project we may draw the following conclusions:

1. The content of materials to be transferred should not be too culture specific, but rather be applicable to a range of different cultural environments.
2. The theoretical and value framework of the materials should be consistent with those of the transferring country.
3. Only those materials, or those portions of materials, should be considered for transfer which have a proven record in the originating country. Otherwise, a poor product will become a poor adaptation, and transfer would be a waste of valuable resources.
4. The international transfer and redevelopment process is not necessarily less expensive than original development. The transfer process can be as expensive and extensive as one chooses it to be.
5. International coordination and agreement on the product development process, which should include standards for evaluation, enhances the chances for a successful transfer.
6. The transfer of one particular product might very well be the start of a substantial number of follow-up products developed on a national level: Through the transfer effort the participants of the receiving countries are stimulated and sometimes trained to look at new possibilities.
7. The international transfer often leads to valuable personal contacts on an international basis. This network might offer ideas or insights in problems and applications which you would not have stumbled on on your own.

An overall conclusion on the effect of international transfer might be that although the savings may not be very substantial when compared to original product development, the additional benefits, such as international contacts and information networks, and new product ideas and possibilities might very well be much more important than the primary transfer effort alone.

II. A model for product development and evaluation

1. History

Developments within education itself, within educational policy and within educational sciences have led to a change in demands made upon schoolbooks. From presentation of more or less structured learning material, the textbook has become the basis of multi-dimensional programming of the learning situations in a classroom. The consequence of this shift in focus is that the development of educational materials has also become a more complicated process.

A. Consequences for the publisher

The first consequence for the educational publisher is that the decision-

making process relating to new publications has to be deepened and broadened. The product developer must decide whether the learning package to be developed is in line with the trends in education and it must be convinced that it meets the demands which may be made on learning materials by teachers and the educational field. The decision to publish a manuscript which has been submitted can only be commercially and economically justified if factors concerning both contents and educational principles have been properly taken into account.

A second consequence of this altered situation is that nowadays good manuscripts are in short supply. As far as educational materials are still offered as manuscripts in the traditional way, they increasingly fail to meet the norms and criteria imposed by the educational publisher from his multidisciplinary expertise.

B. Consequences for the development of educational materials

Nowadays, however, the simple and single term 'manuscript' can hardly be used for educational materials in the development stage and which are about to be duplicated and distributed. Such educational materials in that stage should rather be described as products and services to be used as tools for learning and teaching. All these factors have led to the fact that the educational publishing company, through specialized editorial departments, has come to play a more active and coordinating role in the process of the development of educational materials.
Nowadays by far the greatest number of development projects are initiated and organized by the educational publishing company. For this, a specialized editor, with teaching experience, functions as a project leader and coordinator of authors without, and specialists within the company. The strict printing of the educational materials is preceded by a stage of orientation and development which often lasts a few years. Further, a number of innovative and supportive activities is often a part of the distribution of the definitive edition of educational materials. The educational publishing company has evolved from a printer and distributor into a professional organization for the development of educational materials.

2. The product-market analysis model (P/M analysis)

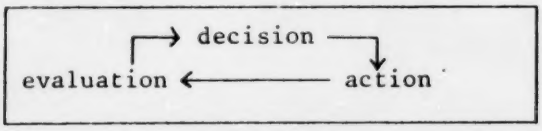
Although there is no unequivocal way in which all educational materials may be developed, there is a certain systematic procedure for this process. During this development procedure, which is formalized in the product-market analysis, all information about education/market variables is integrated and weighed in a number of stages, along with the relevant educational developments and factors which determine the didactic and the technical design. Systematic Evaluation may make an important contribution to this integration and weighing of the various information components.
The way in which this process is integrated in the product development is bound to differ somewhat per subject and per project. The responsibility for this lies with the editor and the authors, possibly supported by service departments.
Because of the reality of education and the pragmatic attitude of a company, it is impossible to adopt one model approach to the development of educational materials at all costs. Each topic and all educational materials to be developed make their own specific demands. Moreover, the contents of

educational materials and even the curriculum requirements are not always officially established, but still have to be developed. That is why the scope of a preliminary investigation and an orientation stage upon and before which a decision to develop educational materials is taken, may vary widely from one case to another.
For the development of a complete new arithmetic or language course for primary education the initial investment may, for example, be a few million guilders before as much as one book is sold. For such a project the economic risks are very great. This is partly why a careful development and evaluation procedure will be started, which can take up to five years to complete. However, there are also much simpler, smaller projects -such as readers, exercise books, etc.- for which such a procedure might be superfluous.

3. Product development and Evaluation

To minimize the risks and to protect and control the initial investments in product development, a careful evaluation procedure should be an integral part of the product development cycle. The importance of well designed evaluation is even greater in the case of an international transfer and product development project.
According to Stufflebeam, Evaluation may be defined as the process of obtaining specific information for the sake of making decisions which then lead to actions. It may be represented as follows:

figure 1: Decision model Stufflebeam



4. Education as a framework for product development

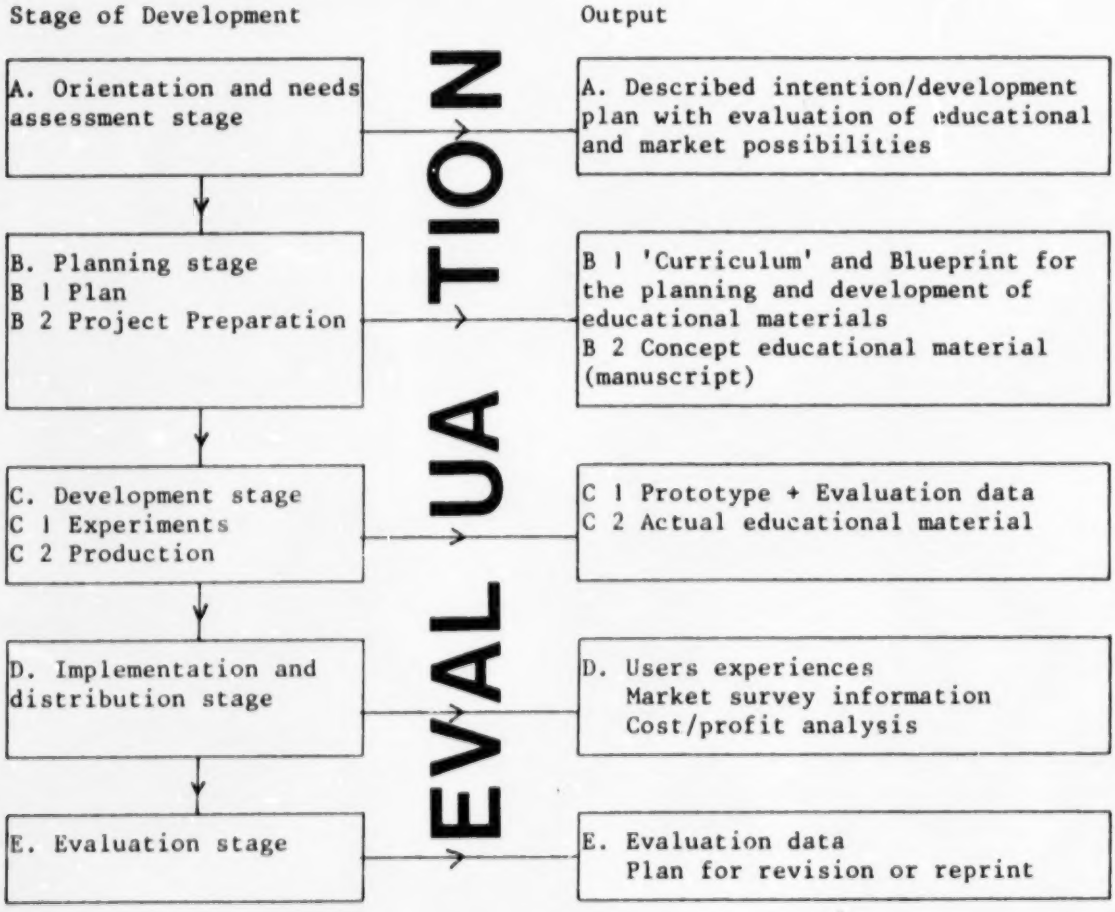
For the formative evaluation, on content and educational consistency, the specialized editorial department as project manager is first and foremost responsible, possibly assisted by a group of authors. Apart from these the department for Study and Research may be asked for assistance for literature research, development assistance and evaluation research.

A survey of the various stages of product development with the results/ decision-making criteria connected with them has been illustrated in the following figure. The successive stages are not quite as firmly and formally separated as represented here. Moreover, quite often feedback and adjustment take the place of information from preceding stages during the process. The figure also indicates how the evaluation process forms the link as a kind of continuous thread and may support the decision making process during the development cycle.
For the figure, see page 7.

In an international cooperative transfer effort, the coordination of the stages of product development and procedures between the participants might be a very hard factor to control. The management of such a project should be very

much aware of the differences between companies in procedures, approach and consecutive steps involved in product development. The model we have here is an 'ideal' which provides check-points and a routing for each product as it develops. The approach used by different companies might vary greatly. The consequences of these differences for an international transfer should be addressed and dealt with very carefully before one begins on such a venture.

Figure 2: The Product/Market (P/M) Analysis as a model for the development of educational materials

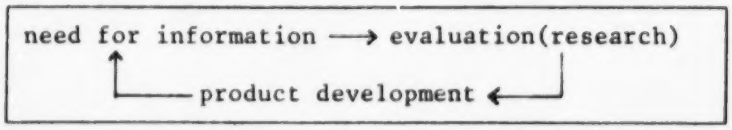

Stage of Development
Output
A. Orientation and needs assessment stage
A. Described intention/development plan with evaluation of educational and market possibilities
B. Planning stage
B 1 Plan
B 2 Project Preparation
B 1 'Curriculum' and Blueprint for the planning and development of educational materials
B 2 Concept educational material (manuscript)
C. Development stage
C 1 Experiments
C 2 Production
C 1 Prototype + Evaluation data
C 2 Actual educational material
D. Implementation and distribution stage
D. Users experiences
Market survey information
Cost/profit analysis
E. Evaluation stage
E. Evaluation data
Plan for revision or reprint
EVALUATION

5. Some brief notes on evaluation in the context of educational materials

5.1 What is evaluation?

In general, evaluation is considered to be the systematic collection and analysis of information for the sake of making decisions.
Within an educational setting this general definition may be more precisely put as follows: Evaluation research aims at the systematic collection of information about pupils, teachers, learning environments and characteristics of educational materials for the sake of the development of educational materials.
This usually happens cyclically as the following figure shows:

Figure 3



5.2 What does an Evaluation research project consist of?

We may distinguish the following steps in an evaluation research project:
1. Problem analysis
2. Research design
3. Development of research instruments
4. Execution of research
5. Analysis and processing of research results
6. Feedback of research results to the people who must make the decisions

Each of these steps will be briefly dealt with below.

1. Problem analysis
The first step in an evalution is the problem analysis. The purpose of this is to establish whether further research and information are necessary. If so, the question/problem must be formulated in such a way that it is fit for research purposes. It is of the utmost importance that the editor and the researcher establish together beforehand what their expectations are for the evaluation and what decisions/consequences may result from a possible evaluation research project. This problem analysis my result in a proposal for a research project.

2. Research design
In the research design, both the scope of the project and the choice of the research instruments are indicated. This design should first of all depend on the importance and the kind of decision that will be made on the basis of the evaluation. This is a crucial point.
Research projects supplying only data, but no specific information, are often wrongly called 'Evaluation'. Such data are not applicable and have no consequences.

3. Development of research instruments: Some techniques for collection of data

3.1 Introduction

It is very important that the sponsor/decision maker knows beforehand what he is committing himself to, in terms of resources and man-hours, at the start of a research project, as well as what final results he can expect. He is the one who makes the decision as to how extensive and expensive a research project may and must be, to supply him with the information needed. This can never be guaranteed however. It stands to reason that the quality of the final results is closely related to the research design (methodology) used and the quality of the research instruments.

3.2 Research instruments

A great number of different instruments may be indicated for each specific method of research. The choice of instrumentation strongly depends on the type of research requested, a consideration of the cost with regard to the reliability of the results, and the information required.
There are two major groups of information collection strategies imaginable:

A) Desk research

Desk research may be carried out usually for the purpose of orientation. This may occur via:

1. Literature research
2. Accounts of comparable research projects
3. Statistical data from the Ministry of Education and Science or the Central Office for Statistics
4. Reports and publications by important institutions functioning within examination of the educational infrastructure
5. Educational budgets and explanatory memoranda.

Desk research is often applied as a first orientation. It sometimes appears that enough information is already available to make a responsible decision possible.

B) Field research

Generally speaking the following instruments can be used in field research:

1. Questionnaires (with open and/or closed answers)
2. Scales (with, for instance, value judgments, more or less, etc.)
3. Interviews (open, structured or closed)
4. Written reports
5. Observations
6. Sociometrical techniques
7. Tests

These instruments may be used either on the whole population/target-group or on a random sample from it.

4. Execution of the research project

The focal point in the execution of the research project is the fact that mutual agreement must be reached on participation (who participates, what each party gets in return), on planning and on the method of research. In addition, agreements must be made on manpower and other resources available. For this reason a (research-) project design is often worked out beforehand.

4.1 Diagram Evaluation research

There are no 'ready-made' guide-lines for choosing a special project development strategy. There are too many variables and conditions which can not be controlled. It is, however, possible to test the desirability (competitors?, market percentage?) and feasibility (manpower, resources) of an Evaluative product development strategy within each separate P/M combination. In general the following diagram may be used for experimental product development through Evaluation (see page 11).

5. Analysis and processing of the research results

Some possibilities:

1) Analysis of open questions, observations and protocols of interviews

This is very time-consuming and demands a fairly subjective (often unreliable) evaluation; procedure: processing is mostly by hand. With open questions it is possible to delve deeper into the qualitative aspects of the process and the contents.

2) Frequency / counts and precoded questions

Comparatively easy to carry out, but not suitable for all research questions. Complex preparatory work is needed to design questions and procedures but relatively easy to process; there exists a danger of exclusion of important answers; may be put on punch cards or optical mark reading documents and then processed by computer.

6. Feedback of the research results

In the last part we will discuss a fully worked-out case-study. This clearly illustrates the feedback of research results for the development of new products. This feedback of information may be of consequence for the decision at three levels:

1) Information relating to the feasibility

In this stage of the product/market analysis the go/no-go decision with regard to further product development or the revision of an existing title is considered.

2) Information relating to the content

Decision at the editorial/author level. Here information is obtained on the structure and contents of the product to be developed, or revision on the grounds of information from the market.

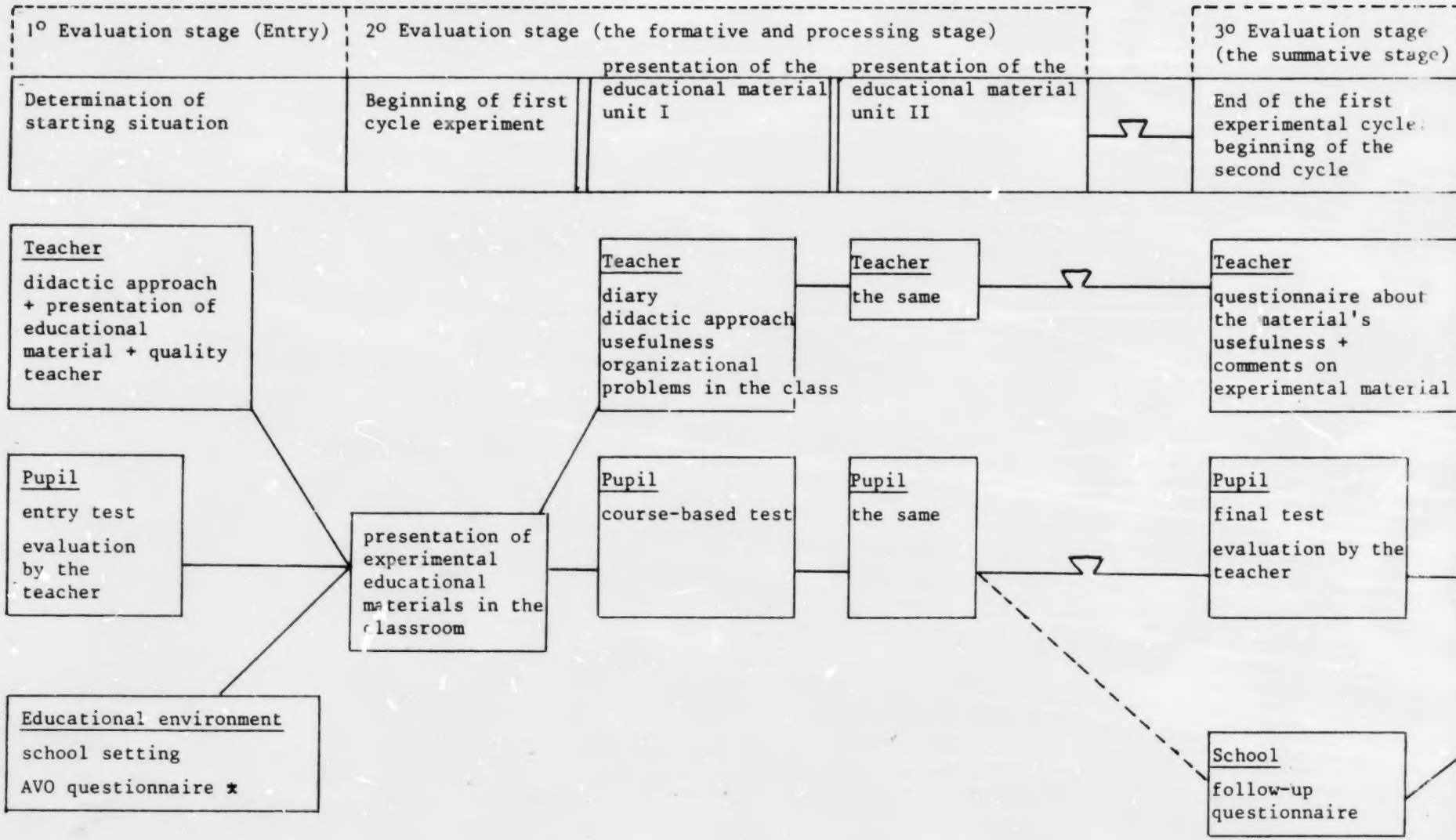
3) Information relating to the market

Decision at the market and P/M levels: Information is obtained on the perceived value, usability and applicability of a product, and the expected consumer resistance and connected implementation problems relevant for inclusion in a promotion plan. New research may be nesessary; this information would be part of the research plan.

7. Summary

The structure and design of Evaluation as outlined above is an ideal model: such a total systematic approach will be necessary for certain projects. In the case of most products, however, implementation and application of parts will be sufficient.

Figure 4: EXECUTION OF EVALUATION RESEARCH FOR EXPERIMENTAL DEVELOPMENT OF EDUCATIONAL MATERIALS



* AVO is an acronym for Aspects of Education Processes (in Dutch)

III Evaluation and the development of educational materials
A case-study

A concrete project in the editorial department for Arithmetic and Mathematics for primary schools is a case in point to illustrate how evaluation may contribute to the decision making process in the development of educational materials.

1. Arithmetic Games: the orientation stage

The first step is the orientation stage. It is drawn up within the context of the editorial department's development strategy.

1. General setting: an analysis of general trends and policy in education, such as the trend towards the integration of pre-primary education, fewer pupils per age group, differentiation, the increasingly important part played by the school counseling agency and the shrinking school population may indicate the framework in which educational materials must perform.
2. Content: to this general setting the following content related items must be added recent developments in the theory of learning arithmetic and mathematics, such as a possible shift from the purely algorithmic approach to a heuristic problem solving approach based on insight.
3. Educational theory: furthermore the interest in Mathematics in Primary Education, in particular the new interest in the Russian psychology of learning.

2. Arithmetic Games: the planning stage

The second step begins with evaluation as a preparation for the planning stage and the analysis of underlying problems. This leads, after consideration of manpower, market and the product's potential, to a review of all development projects, including arithmetic games, to which evaluation research will be able to contribute information (see figure 5).

Stage of development / P/M analysis / project name	orientation A	planning B_1 B_2	development C_1 C_2	implementation D	evaluation E
1. O.H.Z.					
2. H.Z.R.					
3. Herziening H.Z.R.					
4. Toekomstige Reken/ Wiskunde methode					
5. Profax					
6. Rekenspellen					
7. Tafeloefeningsprog.					
8. Rekentoets					
9. Klokkijken					

Figure 5: Analysis of development strategy for the market of Arithmetic and Mathematics for Primary Schools

Because of the internal structure of arithmetic as subject area, it was possible, via a broader project design, to contribute specific evaluative information to different development projects in different (shaded areas) stages of the P/M analysis.

3. The development of Arithmetic Games

Using the basic information from the first Evaluation as a starting point, a number of additional research projects was carried out on behalf of specific products. Thus, as a next step in the Arithmetic Games project, a multi-facetted evaluation research project was conducted.

3.1 Arithmetic Games Background

The use of games in education is subject to a number of conditions, not only as far as their contents and usefulness are concerned, but also with regard to classroom organization. Consequently, an evaluation model was applied in which both formative and summative evaluation procedures were incorporated. The design of the games was based on the fact, diagnosed in the central research project, that some groups of pupils were behind in their arithmetical skills, due to a lack of routine. The usual remedy for this is often the assignment of endless repetition of problems. As an alternative to this, the possibility of incorporating these skills in a game format was considered. This has led to the development of the Arithmetic Games.

3.2 Evaluation of Arithmetic Games

For the formative evaluation stages, the following research design was applied:
Figure 6: Evaluation model Arithmetic Games (see page 14).

Figure 6 : Evaluation model Arithmetic Games

source of information / Evaluation moment	Pupils	Teachers	Learning environment
Initial situation (input evaluation)	Result WN-Arithmetic Test September 1977	Review questionnaire	AVO-questionnaire Discussion with schoolteam
Formative Evaluation during the experiment (process + product evaluation)	Impression of teachers Impression from visits to schools/videotaped observations	Diary and Observation lists of teacher per game moment	Discussion with school team
Summative Evaluation after the experimental stage	Result WN-Arithmetic Test March 1978	Final questionnaire/ questionnaire teacher per game	Discussion with school team Questionnaire per class
Analysis Final Report (product + process evaluation)	Analysis of effective per educational objective	Qualitative analysis per game	A context assessment/ consideration of results

This research project led, per game, to the Evaluation data as summarized in figure 7 (see page 16).

3.3 Decision regarding product development

We have now come to the last and most important stage of the evaluation cycle: the step from the collected data to decision making. An overview of the data from the summative evaluation for the benefit of the decision makers of the Arithmetic Games project is represented in figure 7. For each of the games final judgment similar to that in consumer guides has been drawn up which includes the most important criteria and considerations for a decision: target group/market, contents, design and learning results.

3.4 Resultant actions

Column 6 contains recommendations as to whether or not to develop the game further with modifications. Eventually, a decision will be made in group-discussion in which members of the editorial department, the marketing department, the research unit and the production and design departments participate.
It goes without saying that this broad survey of each individual game is accompanied by a detailed report of the formative and summative research which has been carried out. In this report, all suggestions for alterations and general recommendations have been further worked out. The information contained in this report does not only concern the games' learning effect on pupils, but also their applicability in, and implications for the classroom situation. When the games are sold, the teachers' attention will be directed towards the specific properties and uses of the games which became apparent during the experiment. This enables the publisher to give specific information and make it possible for teachers to make a responsible decision about the purchase of the games.
For figure 7, see page 16.

GENERAL SURVEY Arithmetic Games

(Figure 7)

	1			2	3	4	5		6	
	level						learn. eff.		Inclusion in arith.games package	
NAME OF THE GAME	Original target group Grade level)	Grades in which the experimental games were played	Desirable target group (grade level)	Game satisfactory as game?	Game satisfactory as material for lear.arithm.	Purchase considered ?	Before - after	Compared with control-group	Yes/no	Comments
1. Kom eens achterom, jun.	1	1,2	2	+	+	+	+	o	+	Revise game material and rules
2. Inlijsten	1	1,2	2 h.1 1 h.2	-	++	+	+	o	+	Revise game model
3. Heen en weer	1	1,2	h.1 1 h.2	--	+	+	++	o	+	Revise game model thoroughly
4. Hokjes vullen	1	1,2	1,2	--	+	+	+	o	+	Revise game model thoroughly
5. Ganzenbord	2	1,2	2	+	+	+	++	++	+	Revise game model
6. Kip ik heb je, junior	2	2,3	2	++	+	+	++	o	+	Revise learning objective
7. Met de bus mee 1A	2	2	2	+	+	+	+	++	+	Adjust material and lear.obje
8. Laat het geld maar rol.	3	3,4,5	4	++	++	+	+	+	++	O.K.(see particulars, however
9. Met de bus mee 1	3	2,3	2	--	--	+	?	?	-	Do not include, unless revised entirely
10. Met de bus mee 1B	3	3,4	2	-	+	+	+	o	-	Do not include unless level a organization of games are rev
11. Met de bus mee 1C	3	2,3	2	-	+	+	+	o	-	Do not include unless level a organization of games are rev
12. Geld in 't laatje	4	4	3	+	+	+	+	+	+	Revise level
13. Niemand zeggen .... rondjes leggen	4	3,4	3,4	++	++	+	+	+	++	Revise level and duration of game
14. Ruil maar eens in.	5	4,5,6	4,5	-	++	+	+	+	+	Rewrite explanation in langua children understand; check ga

KEY:

Column 2, 3, 4: ++ = excellent
+ = good
+ = doubtful
- = moderate
-- = poor

Column 5: o = no significant difference
+ = slight increase
+ = marked increase
++ = significant increase
? = no data available

Column 6: ++ = include by all means
+ = include
+ = doubtful
- = do not include

3.5 Summary

We have traced the development and evaluation process of one single project. In the orientation stage a general analysis of market and educational factors within the subject areas arithmetic and mathematics was made. This resulted in the input evaluation, a survey of all projects within this subject. Subsequently, the development of the Arithmetic Games project was worked out from a central evaluation research project. This occurred through an analysis of problems resulting in a product-centered evaluation design. This design included both formative and summative, product and process evaluation moments. The information from this evaluation process led to decisions with regard to the further development of the educational materials. Finally, the research data led to action, i.e. the adjustment of the original concept and indications for the further dissemination. This concludes the Stufflebeam model. It goes without saying that such an elaborate evaluation design is not justified for the development of all educational materials.

4. Discussion and conclusions

There has been quite a stir in recent years with regard to the activities of the educational publisher in regard to the development of educational materials. It is sometimes overlooked that educational publishers are quite restricted in their capabilities to innovate and change and depend a great deal on governmental educational policy and groups within the educational infrastructure. To name a few teacher training and re-training, the Foundation for Curriculum Development, the Central Institute for the Development of Tests, School Advisory Services, National Pedagogical Centres, Educational Material Registration Commissions, etc.
Some tentative conclusions may be drawn on the basis of experiences with experimental research projects during the past few years:

4.1 Evaluation as a sales argument for the educational market

Unfortunately, even today the educational materials which are in our opinion 'the best', are not always those which are most adopted and used. A few comments to qualify this statement:

- This contradiction might be caused by gaps in teacher's initial training and re-training. Teachers are often insufficiently qualified to select and use educational course materials 'professionally'. The question is therefore relevant whether the considerable effort involved in the systematic evaluation of the development of responsible teaching materials will eventually pay off. In recent years, however, a very clear trend is noticeable in that the teacher often makes a decision to adopt courseware in a team after careful and intensive deliberation over alternatives. Another factor of importance is currying the parents' favour in an effort to attract the same number of pupils at a time when the birth-rate is declining.

- The developer of educational materials is torn between what is ideally desirable as far as contents and didactics are concerned and what actually seems to be feasible. Compromises are a reality. Despite these restrictions, Wolters-Noordhoff's development policy is aimed at offering a diversity of educational materials. Along with and sometimes at the expense of traditional educational materials (which after all cater to 85% of the educational field) innovative elements are also included in greater or smaller steps. This

stepwise adoption of innovation results in ensuring product and company continuity. The experiences derived from research which do not immediately lead to higher sales remain available within the company in an operational for fo. the benefit of other projects.

4.2 Evaluation of education as a frame of reference in product development

As one can see, a systematic evaluation when developing educational materials leads to a greater value of the final product. As far as Arithmetic and Mathematics were concerned, a number of specific product developments were initiated on the basis of extensive evaluation research. Such a design, however, does have certain consequences:
in time:
a good evaluation research project requires time and therefore it may slow down the development process;
in organization:
good integration of evaluation makes high demands on the cooperation between the evaluator, authors and the development team to guarantee optimal, and not pedantic, transfer of information and focus (right analysis of problems) of research;
in efficiency:
it is possible to achieve high cost-effectiveness for the collection of information and the development process by including a number of projects simultaneously within one single research design.

IV Summary, conclusions and recommendations

1. Summary

At the start of this paper we have briefly reviewed the research on international transfer of educational products.
Secondly we have focussed on the product development and evaluation process as they are applied in Groningen.
Finally we have discussed a practical application of this model to evaluation in product development.

2. The process of transfer of educational materials: a checklist

In the transfer and adaptation process of educational materials, we have discussed a number of aspects which must be carefully assessed to ensure successful product development. This may be presented in a checklist format.

1) Evaluation of the costs and benefits of transfer as compared to original development

- Transfer effort costs:
  - o amount of change necessary for product adaptation
  - o amount of evaluation and R & D effort in the transfer process
  - o success of developing and implementing the final product

- Transfer benefits:
  - o for the product development process
  - o for the organization and allocation of manpower
  - o spin offs/trade offs to other projects

2) Evaluation of the organizational aspects:
   - o the compatibility of product development processes and procedures
   - o the available expertise
   - o the facilities and manpower allocated

3) Evaluation of educational setting and content related aspects:
   - o the assessment of government regulations and the social context of school curricula
   - o the assessment of background information and trends in the specific content area
   - o the evaluation of school- and evaluation settings
   - o the evaluation of teaching strategies and teacher expertise
   - o the evaluation of learner abilities and entry-level of skills.

3. Conclusions

As a start for the questions and discussion we will formulate some general observations and conclusions on international transfer.

1. Only certain types of educational materials are suitable for transfer. I formulated some of the criteria in section I 4. What additional criteria for selection can be found?

2. The success of international transfer efforts is closely related to management and coordination of the R & D process and the standards of evaluation. We have discussed in section II the development and evaluation model used in Groningen. How compatible is this model and what would be some of the problems involved in your country?

3. International transfer creates a fruitful base from which new product development and international exchange of ideas might bloom. You being here at this international meeting is ample proof that such an international exchange might indeed be an indispensible element for development on a national level.

4. On the cost + benefit side: it might seem on first impression that initial cost transfer + investment in systematic adaptation and evaluation is not necessarily less expensive than original development. In the final analysis there are other benefits to consider, such as:
   1. The product development process can be more directly geared to the needs of a target population.
   2. The process provides spin-offs in the development of other products.
   3. It might lead to a framework for future international exchange. This has as a consequence that within the development process the specific differences between countries are easier to control and account for.
   4. The sharing of expertise on an international level provides more efficient use of scarce resources. By sharing, the basic research the development price per unit might not be any higher, whereas the product will have been much more thoroughly tested and developed.
   5. Because different elements of a package might have greater or lesser appeal to a special target pupulation or cultural setting, a modular, "open", structure of the materials to be transferred is preferable. This results in easier selection and addition in both structure and content according to the national and cultural needs.

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